

[Aircraft Certification Products and Services Page](#)
[Rotorcraft](#)
[Policy](#)

Memorandum

Subject: <u>INFORMATION</u> : Certification Guidelines for Compliance to the Requirements for Electro-Magnetic Compatibility (EMC) Testing for "Equipment Known to Have a High Potential for Interference" when Installed on Rotorcraft with Electronic Controls that Provide Critical Functions	Date: April 25, 2002
From: Acting Manager, Rotorcraft Directorate, Aircraft Certification Service, ASW-100	Reply to Jorge Castillo Attn. of (817)222-5127
To: SEE DISTRIBUTION	Policy ASW-2001-01 No.

1. Purpose: On March 31, 1998, the FAA Rotorcraft Directorate issued a policy letter on "Certification Guidelines for Compliance to the Requirements for Electro-Magnetic Compatibility (EMC) Testing for Non-Qualified Equipment and Equipment Known to Have a High Potential for Interference when Installed on Rotorcraft with Electronic Controls that Provide Critical Functions." The policy issued on March 31, 1998, was reviewed and commented on by other FAA offices and industry. This policy was eventually incorporated into Rotorcraft Advisory Circulars (AC) 27-1B and 29-2C. As a result of this policy, applicants have been conducting the special Electromagnetic Interference (EMI) testing addressed in the policy on many different rotorcraft models equipped with critical controls such as Full Authority Digital Engine Control (FADEC). The Rotorcraft Directorate is hereby revising the previous policy found in the Rotorcraft Directorate policy letter dated March 31, 1998, as well as the policy found in [AC 27-1B](#) and in [AC 29-2C](#). This previous policy is being revised so that certain types of equipment will no longer be required to undergo the special EMI testing addressed in the original policy. The revision to the original policy is due to the fact that adequate test data has been collected on many different rotorcraft models justifying some relaxation to the previous policy.

This new policy statement revises the original March 31, 1998, policy letter; [AC 27-1B](#), Chapter 3, section AC 27 Miscellaneous Guidance (MG) 4, paragraph (d); and [AC 29-2C](#), Chapter 3, section AC 29 MG 4, paragraph (d), such that ONLY the class of "equipment known to have a high potential for interference" will be required to undergo the special EMI testing addressed in this policy statement. Equipment that is not known to have a high potential for interference is not required to undergo the special EMI testing addressed in this policy statement. The criteria for determination of whether equipment falls into the class of "equipment known to have a high potential for interference" is found in paragraph 5.

This revised policy, which provides relaxation of the original policy, was informally reviewed by other FAA offices. Additionally, the Notice of Availability for the revised policy was published in the [Federal Register](#) on October 2, 2001, (66 FR 50246) requesting public comments. The FAA did not receive any

comments from the public. The policy may be revised in the future due to new, unforeseen technology applications or new application of existing technologies in rotorcraft.

2. Background: Rotorcraft operations are varied and use a wide assortment of equipment. While some of this equipment is qualified to aircraft standards, particularly environmental standards, some of the equipment not qualified to such standards may be the source of harmful electromagnetic interference. Rotorcraft typically have not had electronic controls that perform critical functions, such as engine controls and flight controls, therefore there was no real concern about requiring equipment to be qualified to aircraft standards. Typically, this equipment was installed with only a cross-matrix operational check for EMC. These tests consisted of operating the equipment in question and checking visually for an indication of interference. The equipment was, for the most part, non-required equipment and the primary concern was that interference might be emitted from the equipment.

Unqualified equipment and their effects on critical systems is of particular concern due to the recent increase in the number of rotorcraft with electronic engine controls and the implementation of fly-by-wire technology. Additionally, the physical close proximity of installed equipment to electronic controls that provide critical functions is inherent due to the smaller size of most rotorcraft and represents a greater potential for interference than for larger fixed wing aircraft.

3. Requirements: The rules to assure that required functions are not subject to interference are provided in the certification basis for the rotorcraft. Although the certification basis may differ between aircraft, the requirements that address electromagnetic interference are similar and result in the same methods for compliance. A note has been added to the type certificate data sheets for rotorcraft that employ FADECs. This note was added to remind all modifiers that the requirement for addressing interference exists and that special EMI test considerations must be addressed to show compliance. Most EMC considerations can be addressed by the operational interference checks addressed in the background discussion. However, when a critical control function is provided by some electronic means, special EMI test considerations must also be addressed, in addition to the previously described EMC tests. The determination of when these other more rigorous tests are required is a simple concept, but complex in practice. More rigorous testing is required to satisfy the concern for the installation of equipment that would interfere with the critical control (e.g., FADEC, Fly-By-Wire, etc.) or failure management of the critical control. This class of equipment is "equipment known to have a high potential for interference," which may or may not be qualified to an aircraft standard, such as high frequency (HF) radios, high powered radars, hoists, transmitting antennas located near the controls systems, etc. The concern associated with this class of equipment is the possible interference with the critical electronic controls.

4. Accomplishment: In addition to the following special testing considerations addressed in paragraphs 7 and 8, "EMI Installation Testing for Critical Controls" and "Installation Test Conditions," all installed equipment should undergo a cross-matrix operational check for EMC considerations by operating all equipment under consideration and determining if an interference hazard is created.

5. Class of Equipment - Equipment Known to Have a High Potential for Interference: This class of equipment should be tested in the installation as described in the "EMI Installation Testing for Critical Controls/Installation Test Conditions" paragraphs 7 and 8. Since the concern for this class of equipment is its high potential for interference, its EMI laboratory qualification does not preclude the EMI installation testing.

Equipment that meets any one of the following criteria is considered to be "equipment known to have a high potential for interference."

- Equipment that requires 25 amps or more to operate,
- Equipment that transmits 30 watts or more,
- Equipment with an antenna located 0.5 meters or less from the FADEC, or
- High Frequency (HF) Transmitters of any power.

The types of equipment in this class include HF radios, high-powered radars, hoists, high-powered radios, installations where radio transmission antennas are in close proximity to the controls, and equipment that require large currents to operate or radiate strong electromagnetic fields. Examples of this type of equipment are some Emergency Medical Service (EMS) equipment, night sun lights, some air conditioners, video and sound systems that require large currents (25 amps - up) to operate, Forward Looking Infrared System (FLIRS), some forward looking radars, some weather radars, some communication systems that transmit 30 watts or more, some data link transmission systems, etc.

NOTE: Equipment that does not meet this criteria is considered to be "equipment not known to have a high potential for interference."

6. Class of Equipment – Equipment Not Known to Have a High Potential for Interference: Once it has been established that the equipment being proposed to be installed is not in the class of "equipment known to have a high potential for interference", per the criteria stated in paragraph 5, there is no requirement to conduct the EMI installation tests described in the "EMI Installation Testing for Critical Controls/Installation Test Conditions" paragraphs 7 and 8. However, the cross-matrix operational checks for EMC considerations described in paragraph 4 are still required.

7. EMI Installation Testing for Critical Controls: EMI installation testing is no longer required for unqualified equipment that does not have a high potential to cause interference. However, EMI installation testing is the only method of testing to show compliance for interference considerations, for the class of "equipment known to have a high potential for interference." The criteria for determining whether the "equipment is known to have a high potential for interference" is stated in paragraph 5.


To accomplish the EMI installation tests, there must be an FAA-approved test plan that requires the high interference potential equipment to be operated through all reasonable modes of operation in order to determine if electromagnetic interference is entering the electronic control system. EMI installation testing consists of interrogating the control, if it has such a feature, to determine if the critical electronic control system is adversely affected (identify the recorded faults that occur during the test). Additionally, real-time monitoring of the control's input/output parameters should be accomplished. The pass/fail criteria is "no detected interference" for a pass state, and conversely a fail state if any interference is detected entering the control. If interference is detected, the source of interference should be investigated to determine if the detected interference is the worst case. In some cases, the detection of interference may result in flight tests being required to determine if the interference is worse in flight. After the worst case interference is defined, the interference must be eliminated at the source or the interference must be evaluated to assure that the critical electronic controls, its functions, and its related indications do not result in an unsafe condition. For FADECs, special test equipment developed by the engine manufacturer will be required to interrogate and monitor the controls input/output parameters. Other types of critical controls may also require special test equipment to perform this type of testing.

8. Installation Test Conditions: "Equipment known to have a high potential for interference" represents the main concern for radiated and conductive interference; therefore, ground and flight tests are usually required. Therefore, when the EMI installation tests described in paragraph 7 are required, ground and flight tests will usually need to be conducted. Ground tests alone are usually not sufficient since some equipment may pose safety issues if operated on the ground, while other equipment cannot be satisfactorily operated on the ground, or the equipment would provide misleading results if operated on the ground. For example, some equipment is prohibited from being operated on the ground, such as hoists.

If the proposed installed equipment has been tested in relation to the critical electronic control system on another identical installation, then there can be an exception to the EMI installation testing requirements defined in paragraph 7 and 8. The data showing identity of the equipment and installation with passing test data are acceptable in place of further testing on the same type rotorcraft.

9. Summary: The concern for potential interference to electronic controls that provide critical functions may be addressed by the methods contained within this document. To address the interference aspects of "equipment known to have a high potential for interference," the equipment must be tested as a part of the installation as described in paragraphs 7 and 8, during ground and flight tests.

Please address any questions to Mr. Robert McCallister at (817) 222-5121, or Mr. Jorge Castillo at (817) 222-5127. E-mail addresses are Robert.R.McCallister@faa.gov or Jorge.R.Castillo@faa.gov.



Eric Bries

DISTRIBUTION

Manager, Seattle Aircraft Certification Office, ANM-100S
Manager, Los Angeles Aircraft Certification Office, ANM-100L
Manager, Denver Aircraft Certification Office, ANM-100D
Manager, Chicago Aircraft Certification Office, ACE-115C
Manager, Wichita Aircraft Certification Office, ACE-115W
Manager, Atlanta Aircraft Certification Office, ACE-115A
Manager, Anchorage Aircraft Certification Office, ACE-115N
Manager, Boston Aircraft Certification Office, ANE-150
Manager, New York Aircraft Certification Office, ANE-170
Manager, Brussels Aircraft Certification Office, AEU-100
Manager, Fort Worth Aircraft Certification Office, ASW-170
Manager, Fort Worth Airplane Certification Office, ASW-150
Manager, Fort Worth Special Certification Office, ASW-190
Manager, Certification Procedures Branch, AIR-110
Manager, Small Airplane Standards Staff, ACE-110
Manager, Engine and Propeller Standards Staff, ANE-110
Manager, Transport Airplane Standards Staff, ANM-110

Manager, Aircraft Engineering Division, AIR-100
Manager, Small Airplane Directorate, ACE-100
Manager, Engine and Propeller Directorate, ANE-100
Manager, Transport Airplane Directorate, ANM-100